

## **Appendix 1-A**

### **Stormwater Management Systems Design Procedure**

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	Section
I. Project Startup Feasibility Analysis	
A. Identify goals, objectives and issues .....	1
1. Wetlands and wildlife	
2. Floodplains and other drainageways	
3. Erosion and sediment control and stream channel stability	
4. Stormwater management goals and objectives	
5. Adjoining stormwater systems	
6. Probable future development	
B. Collect basic data .....	2.1
1. Topographic information	
2. Survey and boundary data	
3. Soils and geologic data	
4. Utilities	
5. Hydrologic and hydraulic data	
6. Regulatory data	
7. Previous studies	
8. Evidence of historic flooding	
9. Projected land use	
10. Existing floodplain maps	
III. Planning and Preliminary Engineering Design	
A. Prepare or obtain development plan	
B. Develop conceptual stormwater management plan alternatives	
C. Prepare preliminary design	
1. Select runoff method based on area .....	2.1
2. Determine design storm frequencies .....	2.4
a. Major storm	
b. Minor storm	
3. Locate outfalls and assure adequate outfall capacity .....	2.3
4. Obtain rainfall .....	2.5 or 2.6
5. Evaluate run-on .....	2.5 or 2.6
a. Master planned basins	
b. Non-master planned basins	
6. Identify natural drainageways	
7. Delineate subbasins	
8. Calculate runoff for pre-and post-development conditions .....	2.5 or 2.6
9. Refine conceptual alternatives	
10. Perform drainage calculations .....	2.5 or 2.6
11. Determine preliminary conduit and open channel size .....	3.5

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12. Select storage facility type	
a. On channel	
b. Off channel	
c. Regional	
d. "Wet"	
e. "Dry"	
13. Determine preliminary storage facility volume .....	6.6
14. Define preliminary design	
a. Drainage pattern and flow rates	
b. Preliminary system layout	
15. Check flood risk on upstream and downstream properties due to proposed development	
III. Final Engineering Design	
A. Review all preliminary work and check with goals, objectives and issues defined in I-A	
B. Obtain final street grades and geometrics	
C. Coordinate	
1. Water	
2. Sewer	
3. Paving	
4. Public utilities	
D. Hydraulically design the storm drain systems	
1. Street and intersection design .....	3.2 or 3.3
a. Determine street classification(s)	
b. Determine street capacity for minor and major storms	
c. Compare street conveyance capacity with grading plan	
2. System layout .....	3.4
a. Location requirements	
b. Manhole spacing	
c. Grade and cover/Structural loading	
3. Hydraulic design of storm drain conduit (establish HGL) .....	3.5
a. Closed conduits	
b. Pressurized conduits	
c. Structures	
d. Outfalls	
4. Storm drain inlets .....	3.2
a. Location and spacing .....	3.2.5
b. Types .....	3.2.4
(1) Curb inlets	
(2) Grate inlets	
(3) Special purpose inlets	
5. Culverts and bridges	
a. Determine overtopping frequency .....	4.5
b. Perform hydraulic analysis .....	4.6
c. Energy dissipation/outlet treatment .....	7.1
d. Analyze debris control	
e. Structural loading	

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6.	Drainageways (open channels)	
a.	Select channel type .....	5.4
b.	Hydraulic analysis .....	5.5
c.	Channel stability analysis and design .....	5.10
E.	Stormwater storage facilities	
1.	Environmental and water quality considerations .....	6.2
2.	Determine storage and outlet characteristics	
a.	Storage requirements including sediment accumulation .....	6.4
b.	Basin configuration .....	6.4
c.	Embankment criteria .....	6.4
d.	Spillway sizing and performance during extreme events .....	6.5
e.	Outlet performance .....	6.7
f.	Operation and maintenance .....	6.13
g.	Trash Racks .....	6.15
F.	Water quality enhancement	
1.	Develop water quality control strategy .....	8.2
2.	Select site control measures	
a.	Structural BMPs .....	8.3
b.	Non-structural BMPs .....	8.4
3.	Implement water quality management measures .....	
G.	Develop erosion and sediment control (ESC) plan	
1.	Identify soil erosion factors .....	9.2
2.	Develop ESC strategy .....	9.4
3.	Select BMPs .....	9.5
4.	Design BMPs .....	9.6
5.	Prepare Stormwater Pollution Prevention Plan (SWPPP) .....	9.7
6.	Submit SWPPP .....	9.8
H.	Economic and safety considerations .....	

#### IV Submittals and Review

#### V Construction Phase

- A. Obtain approvals and permits
- B. Site observations
- C. Prepare record drawings

#### VI Operation and Maintenance Phase

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